



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
Group Art Unit 1649

In re

Patent Application of

Vincent Chiang et al.

Serial No. 08/969,046

Filed: November 12, 1997

Examiner: Ousama M-Faiz Zaghmout Ph.D.

For: GENETIC ENGINEERING OF TREES THROUGH MANIPULATION OF LIGNIN  
BIOSYNTHESIS

I, Diane J. Frauchiger, hereby certify that this correspondence is being deposited with the US Postal Service as first class mail in an envelope addressed to Assistant Commissioner for Patents, Washington, D.C. 20231, on the date of my signature.

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Signature

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Date of Signature

**DECLARATION UNDER 37 C.F.R. 1.131**

Assistant Commissioner for Patents  
Washington, DC 20231

The undersigned hereby declare and state:

1. THAT we are co-inventors of the subject matter of all the claims (i.e., claims 1-38) of the above-identified U.S. patent application, as filed. We have assigned all rights, title and interest in the above-cited invention to the Board of Control of Michigan Technological University. This Declaration is submitted in furtherance of prosecution of the above-cited application.
2. THAT all statements made herein based upon our own knowledge are true, and all statements made on information and belief are believed to be true.
3. THAT this DECLARATION UNDER 37 C.F.R. § 1.131 is, specifically, being filed to overcome Kajita., et al., *Plant Cell Physiol.* Vol. 37 No.7, pp. 957-965 (October 1996) (hereinafter, "Kajita *et al.*"), a publication cited as the primary reference for rejecting claims 1-38 in an Office Action mailed February 16, 2000 in the prosecution of the present patent application. Kajita et al. was received by the Steenbock Memorial Library at the

University of Wisconsin, Madison, one of the major science libraries at the University of Wisconsin, on January 2, 1997, as evidenced by a date stamped copy from the title page and Table of Contents of the volume of the above-cited journal in which the article was published, attached herein as Exhibit A. We understand that the Kajita et al. article is considered to be published when it is placed in the hands of members of the public, i.e., January 2, 1997. We also understand that the Kajita et al. reference can be removed as an improper reference by demonstrating that the claimed subject matter of the present invention was conceived and diligently pursued to reduce to practice in this country prior to the publication of that reference, i.e., prior to January 2, 1997.

4. THAT prior to January 2, 1997, we had conceived and diligently worked to reduce to practice the invention described in the subject application and as defined in claims 1-38 in this country, as evidenced by the following:

- a. Prior to January 2, 1997, we conceived of the idea of altering certain characteristics of trees, by incorporating into the genome of the tree a nucleotide sequence encoding 4CL. This is evidenced by the letter to Dr. Kunio Hata proposing the above stated research project, attached as Exhibit B, on which the dates have been deleted in accordance with PTO practice.
- b. Prior to January 2, 1997, we cloned p-coumarate Coenzyme A ligase (4CL) gene from a tree, Aspen, evidenced by the attached Exhibit C, on which the dates have been deleted in accordance with PTO practice.
- c. Prior to January 2, 1997, we constructed a binary expression vector having a nucleotide sequence encoding 4CL in the antisense orientation under the control of the cauliflower mosaic virus 35S promoter. The vector was mobilized into a strain of *Agrobacterium*

*tumefaciens* C58/pMP90 which was used as the delivery system for the sequence. Aspen leaf disks were transformed with this vector, as evidenced by the laboratory notebook page 92 attached as Exhibit D. Furthermore, evidence that the transformants were produced and maintained as *in vitro* cultures prior to January 2, 1997 is attached as Exhibit E, on which the dates have been deleted in accordance with PTO practice.

- d. Prior to January 2, 1997, the first batch of *in vitro* transgenic Aspen trees (tree # 11-1, 11-2, 11-3, 11-4, 12-1, 12-2, 12-3) were transferred into the green house and the accelerated growth characteristic was observed, as evidenced by comparing the heights of transgenic lines with the wild-type control at various stages of growth in the greenhouse, attached as Exhibit F.
- e. Prior to January 2, 1997, the second batch of *in vitro* transgenic Aspen trees (tree # 11-5, 11-6, 11-7, 11-8, 11-9, 11-10, 11-11, 12-5, 12-6, 16-2, 16-3, 17-1, 17-2) were transferred into the green house and the accelerated growth characteristic was observed, as evidenced by comparing the heights of transgenic lines with the wild-type control at various stages of growth in the greenhouse, attached as Exhibit G.
- f. Prior to January 2, 1997, photographs of the greenhouse grown transgenic Aspen were taken and tissues of transgenic Aspen were examined under a microscope to observe variation in lignification of the transgenic plant, evidenced by the attached lab notebook page 88 as Exhibit H and lab notebook page 91 as Exhibit I, respectively.

- g. Prior to January 2, 1997, detailed molecular characterization was conducted to authenticate the success of producing antisense 4CL transgenic Aspen. Furthermore, prior to January 2, 1997 lignin reduction in antisense 4CL transgenic Aspen was histologically confirmed. The molecular and histological confirmation of the antisense 4CL transgenic Aspen are evidenced by the attached lab notebook pages 00-51 as Exhibit J.
- h. From prior to January 2, 1997 until a time just prior to the filing of the present patent application, we transformed multiple aspen trees with 4CL, and quantitatively confirmed lignin reduction in various antisense 4CL transgenic Aspen trees, evidenced by attached lab notebook page 40 as Exhibit K. Also, prior to January 2, 1997 certain other characteristics, e.g., increased cellulose content, reduced lignin content and fungal pathogen resistance, were observed in various antisense 4CL transgenic Aspen trees as evidenced by attached Exhibit L.
- i. In accordance with the invention disclosure procedure and policy of Michigan Technological University, we submitted an Invention Disclosure to the Intellectual Properties Office on April 15, 1997, to seek authorization to seek patent protection for our invention (Exhibit M).
- j. The Invention Disclosure was forwarded to the University's patent counsel Michael Best & Friedrich LLP ("Patent Counsel") for review in preparation of a patent application on May 29, 1997, (Exhibit N), and Patent Counsel was authorized to prepare a patent application by facsimile transmittal of June 5, 1997 (Exhibit O).

k. Patent Counsel forwarded a preliminary draft of the patent application with their letter of September 24, 1997 (Exhibit P) . From this time until just prior to the filing of the application, we continued to work with Patent Counsel in reviewing and revising the application.

l. On October 27, 1997, Patent Counsel forwarded a final revised application by their letter of the same day (Exhibit Q).

m. By our e-mail communication of November 11, 1997 (Exhibit R) to Patent Counsel, we submitted all final changes and the application was filed on November 12, 1997.

5. THAT all dates deleted from Exhibits B through L are prior to January 2, 1997.

6. THAT all of the above notebook pages were taken from the lab notebook of Wen-Jing Hu, one of the undersigned scientists and the lab notebook of Jackie Popko, laboratory manager, who was working under the direction of the undersigned scientists.

7. THAT all statements herein of own knowledge are true, that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like as made are punishable by fine or imprisonment or both under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: Oct. 30, 2000

Vincent C. Chiang  
Vincent Chiang, Ph. D.

Date: Nov. 1, 2000

Chung-Jui Tsai  
Chung-Jui Tsai, Ph. D.

Date: Nov. 2, 2000

Wen-Jing Hu  
Wen-Jing Hu, Ph. D.